APPENDIX A CLAIMS

1. (Currently amended) A motion picture electronic watermark system, for embedding information in frames, comprising:
(1) means for preparing information to be imbedded as bits in a bit stream;
(2) means for ~~alternating the signs of~~ inversing each bit in means for alternating the signs of said bit stream in accordance with a sign inversion cycle;
(3) means for embedding said bit stream in said frames.

2. (Previously presented) The motion picture electronic watermark system, according to claim 1, wherein said means (2) includes means for adding bit signs to said bit stream.

3. (Currently amended) A motion picture electronic watermark detection system, for employing statistical observation of frames to detect embedded information, comprising:
(1) means for accumulating values through observation of frames, separating first signals from signals for expressing information and employing signals that express information in the descending order of the intensities of said first signals;
(2) means for comparing the accumulated values through observation with threshold values that vary in accordance with said accumulated values; and
(3) means for employing the comparison results to detect said embedded information.

4. (Previously presented) The motion picture electronic watermark detection system according to claim 3, which normalizes the values through observation of frames and accumulates the normalized values.

5. (Previously presented) The motion picture electronic watermark detection system according to claim 3, wherein before accumulating said values obtained through observation of frames, said means (1) changes the signs of said values.

6. (Previously presented) The motion picture electronic watermark detection system according to claim 3, wherein at intervals of half a sign inversion cycle, said means (1) inverts the signs of said values obtained through observation of frames and accumulates the sign inverted values.

7. (Previously presented) The motion picture electronic watermark detection system according to claim 3, wherein at intervals of one quarter of said sign inversion cycle, said means (1) stores all values obtained through observation of frames in two accumulators A and B in the order addition for A, addition for B subtraction for A and subtraction for B.

8. (Previously presented) The motion picture electronic watermark detection system according to claim 3, wherein said means (1) prepares two accumulators A and B, and accumulates values obtained by observation of frames in said accumulator A at intervals of one quareter of said sign inversion cycle, in the order addition for A, addition for A, subtraction for A and subtraction for A, and in parallel to this process, accumulates values obtained by the observation of frames in said accumulator B the order addition for B, addition for B, subtraction for B and subtraction for B.

9. (Currently amended) The motion picture electronic watermark detection system according to claim ~~7 or~~ 8, further comprising means for, when a bias exists in the signs of values accumulated in said two accumulators, providing an upper limit for said bias.

10. (Currently amended) A motion picture electronic watermark method for embedding information in frames comprising the steps of:
(1) preparing information to be imbedded as bits in a bit stream;
(2) ~~alternating the signs of~~ inversing each bit in said bit stream in accordance with a sign inversion cycle;
(3) embedding said bit stream in said frames.

11. (Currently amended) A motion picture electronic watermark detection method for employing statistical information in frames comprising the steps of:
(1) accumulating values through observation of frames and separating first signals from signals for expressing information and employing signals that express information in the descending order of the intensities of said first signals;
(2) comparing the accumulated values through observation with threshold values that vary in accordance with said accumulated values; and
(3) employing the comparison results to detect said embedded information.

12. (Currently amended) A recording medium for storing a motion picture electronic watermark detection system, for employing statistical observation of frames to detect embedded information, comprising:
(1) a function for accumulating values through observation of frames and separating first signals from signals for expressing information and employing signals that express information in the descending order of the intensities of said first signals;;
(2) a function for comparing the accumulated values through observation with threshold values that vary in accordance with said accumulated values; and
(3) a function for employing the comparison results to detect said embedded information.

13. (Currently amended) A DVD system ~~which includes~~ comprising a motor for a rotating disk; a pickup for reading and writing a signal on said disk; a drive circuit for controlling said motor and said pickup; a DVD control block for issuing a command to said drive circuit; a decoding block for performing signal conversion and error correction; an electronic watermark control block for embedding information or detecting embedded information; and an interface unit for communicating with an external device; said electronic watermark control block comprising:
(1) means for preparing information to be imbedded as bits in a bit stream;
(2) means for [alternating the signs of] inversing each bit in said bit stream in accordance with a sign inversion cycle;
(3) means for embedding said bit stream in said frames.

14. (Currently amended) A DVD system ~~which includes~~ comprising a motor for a rotating disk; a pickup for reading and writing a signal on said disk; a drive circuit for controlling said motor and said pickup; a DVD control block for issuing a command to said drive circuit; a decoding block for performing signal conversion and error correction; an electronic watermark control block for embedding information or detecting embedded information; and an interface unit for communicating with an external device; said electronic watermark control block comprising:
(1) means for accumulating values through observation of frames and separating first signals from signals for expressing information and employing signals that express information in the descending order of the intensities of said first signals;;
(2) means for comparing said accumulated values through observation with threshold values that vary in accordance with said accumulated values;
(3) means for employing the comparison results to detect said embedded information.

15. (Currently amended) The motion picture electronic watermark detection system according to claim 3, wherein said means (1) accumulates values through observation of frames and separates first signals from signals for expressing information and employing signals that express information in the descending order of the intensities of said first signals, (2) ~~using~~ uses a periodical detection mask that does not depend on relative positions, when information is embedded and when said information is detected.

16. (Previously presented) The motion picture electronic watermark detection system according to claim 3, wherein said means (1) removes an overlapping positional relationship using a history of a relative positional relationship between frames, when information is embedded and when said information is detected, so that a correlation existing among sequential frames is removed and values are accumulated through observation of said frames.

17. The motion picture electronic watermark detection system according to claim 3, wherein said means (1) uses multiple masks to embed and detect information, and (2) removes duplicate values obtained from the same mask, so that a correlation existing among sequential frames is removed and values are accumulated through observation of said frames.

18. (Canceled) The motion picture electronic watermark detection system according to claim 3, wherein said means (1) accumulates values through the observation of frames, separating first signals from signals for expressing information and employing signals that express information in the descending order of the intensities of said first signals.

19. (Currently amended) The motion picture electronic watermark detection system according to claim ~~18~~ 1 wherein said first signals are signals that express sign of said information.

20. (Currently amended) A computer program product comprising a computer useable medium having computer readable program code means embodied therein for causing motion picture electronic watermark detection by employing statistical observation of frames to detect embedded information, said computer readable program code means in said computer program product comprising computer readable program code means for causing a computer to effect:

(1) accumulating values through evaluation of frames and separating first signals from signals for expressing information and employing signals that express information in the descending order of the intensities of said first signals;

(2) comparing said accumulated values through observation with threshold values that vary in accordance with said accumulated values; and

(3) employing the comparison results to detect said embedded information

and wherein in said accumulating of values through the observation of frames, first signals are separated from signals for expressing information, and signals are employed that express information in the descending order of the intensities of said first signals. --

--21. (Previously presented) The motion picture electronic watermark detection system according to claim 3 , wherein said means (1) prepares two accumulators A and B, and accumulates values obtained by observation of frames in said accumulator A at intervals of one quarter of said sign inversion cycle, in the order addition for A, addition for A, subtraction for A and subtraction for A, and in parallel to this process, accumulates values obtained by the observation of frames in said accumulator B the order addition for B, addition for B, subtraction for B and subtraction for B and further comprising means for, in the event a bias exists in the signs of values accumulated in said two accumulators, providing an upper limit for said bias. --

processing according to the present invention.

Fig. 3 is a flowchart for embedding processing where the sign of an embedded signal is changed in accordance with the sign inversion cycle.

Fig. 4 is a flowchart for sign inversion for a long cycle and signal detection obtained by observation every half cycle.

Fig. 5 is a flowchart for signal detection using the accumulation method when an embedding cycle and a detection cycle are not synchronized.

Fig. 6 is a diagram showing sign inversion for a long cycle and an observation method employed every half cycle.

Fig. 7 is a diagram showing an accumulation method when an embedding cycle and a detection cycle do not match.

Fig. 8 is a diagram showing another accumulation method when an embedding cycle and a detection cycle do not match.

Fig. 9 is a diagram illustrating a hardware arrangement for a system of the present invention and a system that is connected thereto.

Fig. 10 is a diagram illustrating a DVD system having an electronic watermark control block according to one embodiment of the present invention.

Fig. 11 is a diagram showing the DVD system externally connected to a system 100.

Fig. 12 is a diagram showing the DVD system incorporated in the system 100.

Fig. 13 is an equation for carrying values obtained by observation of a frame to a succeeding frame and for determining the presence of an embedded signal using the sum of two values.

value of a signal obtained by observation is intentionally provided so that it will not be distributed, the value obtained by observation is expected to increase in proportion to f. Thus, when the accumulated value U[i] is normalized by dividing it by $\sqrt{f}$:

~~[Equation 1]~~ Figure 13

$$U[i] = \frac{1}{\beta}(V\_(k+1)[i]) + (V\_(k+2)[i]) + \ldots + (V\_(k+f)[i])$$

wherein a value for noise obtained by observation can be regarded as a random variable having the normal distribution of variance 1. V_j[i] represents the statistical value of the i-th bit obtained by observation of the j-th frame, and can, therefore, be compared with the fixed threshold value T. Since the accumulated value U[i] for a signal is increased in proportion to $\sqrt{f}$, so long as f is satisfactorily large, the value U[i] can exceed the fixed threshold value T. According to this method, even when an embedded signal is considerably attenuated, so long as the signs for the values accumulated for the frames are substantially uniform, the false negative error can be approximated and brought as close as zero by increasing the number of accumulated frames.

[0008]

* Exclusion of correlation of sequential frames

Generally, sequential motion picture frames strongly correlate with each other. In other words, because frames differ little from each other and strongly correlate with each other, they can be replayed as motion pictures. In an extreme case, the correlation coefficient is the maximum for motion pictures in which the same contents are

$$U[i]=\frac{1}{\sqrt{f}}(V\_(k+1)[i])+(V\_(k+2)[i])+\ldots+(V\_(k+f)[i])$$

Fig. 13

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Amendment
w/ pps 7, 10 and Fig. 13